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Can Social Safety Nets Alleviate Seasonal Deprivation?

Evidence from Northwest Bangladesh

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Abstract

This paper examines the role of social safety-net programs in Bangladesh run by the government and nongovernmental organizations to mitigate seasonal deprivation in the country's highly vulnerable northwest region. Specifically, the paper explores whether social safety nets are limited to averting seasonal deprivation or can also address seasonality of income and employment more generally. Using a recent survey from the greater Rangpur (northwest) region, the paper finds that social safety nets have a positive effect on mitigating both seasonal and non-seasonal food deprivation. The results are robust, owing to the recent expanded coverage of social safety-net programs run by nongovernmental organizations active in the region. But given the annual recurrence of *monga* (seasonal food insecurity) in the northwest region owing to agricultural seasonality and an overwhelming dependence on agriculture for livelihoods, social safety nets are not a reliable tool for *monga* eradication. Programs are also needed to promote the income and productivity of the poor through diversification of income and employment.

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Can Social Safety Nets Alleviate Seasonal Deprivation? Evidence from Northwest Bangladesh

1. Introduction

Poor households in every corner of the world are vulnerable to both internal and external shocks. In Bangladesh, one recurring internal shock is seasonal famine, known as *monga*, which strikes the greater Rangpur (northwest) region each year with varying intensity during September–November (*Ashwin–Kartik* in Bengali), corresponding to the pre-harvest season for *Aman* rice. Lack of agricultural activity during this period essentially leads to unemployment among the vast majority of rural people.

Most poor people in greater Rangpur live marginally on low-paying wages or other income-generating activities—mostly agriculture-related—with little or no savings, insurance, or access to formal credit. Predictably, they often go unemployed during the monga season. To maintain a minimum livelihood, many are forced to sell their standing crops or labor in advance at lower-than-market price; some sell their assets, and others borrow from informal moneylenders at an exorbitant rate (Khandker 2011). Many others migrate to other parts of the country for income-earning opportunities (Khandker, Khalily, and Samad, forthcoming; Chowdhury, Mobarak, and Bryan 2009).

While poor households adopt various coping strategies during monga, these may not suffice to stave off starvation or food rationing. In this recurring crisis, governments and nongovernmental organizations (NGOs) intervene with various social-protection or safety-net measures that provide these poor households assistance in the form of cash, food support, and income opportunities. Most such programs are designed to provide households immediate support during monga, while some are long-term interventions.

Safety-net programs designed to address seasonal deprivation alone are not confined to Bangladesh. In most countries where the greater segment of the rural population depends on an

agriculture-based economy, income seasonality is both common and somewhat predictable. In a recent study of four African countries, Devereux (2009) shows that a variety of social-protection experiments had varying degrees of success. These programs have included (i) a productivity-enhancing safety net implemented in Ghana in the 1980s to promote household food security and reduce the seasonal hunger gap, (ii) food-for-work and vulnerable-group-feeding programs in Namibia in the 1990s, (iii) emergency cash transfers in Malawi in the mid–2000s in response to localized crop failures, and (iv) cash transfers in Ethiopia in the mid-2000s to cover a hunger gap of four-to-six months and household extension packages.

Social protection is recognized globally as a strategy to safeguard the economic security of the poor. It provides support to the vulnerable and the poorest in order to address the causes—not simply the symptoms—of poverty. According to Holzmann and Grosh (2008), a social-protection policy is a risk-reducing instrument that includes public policies assisting individuals, households, and communities in better managing risk, thus ensuring a minimum living standard for poverty-stricken people.

Safety-net measures can be categorized according to their objectives: cash- or food-transfer programs, price subsidies, provision of human capital, public-works programs, and microcredit and informal insurance programs (Babu 2003). The extent of these programs' coverage depends on the extent of hardship of vulnerable households, as well as availability of funds. However, an apparent small fund transfer in a safety-net program does not necessarily mean a small net gain; for example, small gains in consumption due to a safety net may imply a net gain for an aversion of high risk by households (especially those due to subsistence constraints in developing countries). An example of such a high risk measure could be withdrawing children from school. In such circumstances, social insurance or social safety-net programs may enhance the welfare of the poor by providing a less

costly, consumption-smoothing mechanism relative to alternative, desperate measures (e.g., Chetty and Looney 2006).

A priori, there are good reasons for introducing social safety-net programs to mitigate monga and other proximate causes of seasonality of poverty. Thus, assessing their benefits is essential for better targeting and resource allocation. One approach to assessing such benefits is to quantify their safety-net (social-protection) roles against their income-augmenting roles. Even though safety-net measures are geared toward mitigating economic stress caused by shocks, it is possible that easing economic stress may have a positive effect on assets and longer-term income; that is, a targeted program may reduce chronic, as well as transitory, poverty. But in some cases, the short-term benefits of safety-net programs may exceed long-term ones. Ravallion, van de Walle, and Gautam (1995), for example, showed that the effect of a social safety-net program on persistent poverty may be low, even if it contributes substantially to reducing transitory poverty. Using a two-point (1987 and 1989) panel data set from Hungary, this study attempted to distinguish between the roles of protecting and promoting the poor, while evaluating the country's cash benefit programs. The study's findings suggest that, in the absence of safety-net interventions, the poverty rate would rise by 7.6 percentage points, with 6.6 percentage points due to the transition from non-poor to poor status between the two years and 1 percentage point due to the inability to move out of poverty. Thus, this safety net was found to be more effective in preventing transient poverty than reducing chronic poverty.

In contrast, Devereux (2002) found that a social safety-net program could alleviate both transitory and chronic poverty. This study distinguishes among three dimensions of poverty—low-labor productivity, vulnerability, and dependency—and two categories of anti-poverty intervention—livelihood promotion and livelihood protection. Within this framework, social safety nets were seen as publicly-funded transfer programs with consumption smoothing, as opposed to

mean-shifting, objectives. Yet safety nets can have both protection and promotion effects. Drawing lessons from three case studies in southern Africa, Devereux (2002) confirmed that even tiny income transfers are often invested in income-generating activities, education, social networks, or the acquisition of productive assets, suggesting that these programs have both short- and long-term effects on household welfare.

One of the world's largest and most prominent, government-supported social safety-net programs is Mexico's ongoing Education, Health, and Nutrition Program, known as PROGRESA (*Programa de Educación, Salud, y Alimentación*). PROGRESA takes an integrated approach to reaching the poor, combining education, health, and nutrition interventions in a single package. The approach has succeeded in improving the poor's capacity to lift them out of poverty (Skoufias, Davis, and Behrman 1999*)*. The largest poverty reduction achieved by PROGRESA has been among the poorest of the population (Skoufias 2001). In addition to its consumption effects, PROGRESA has led to higher school enrollment for both boys and girls (Schultz 2000) and a reduction in stunted growth among children 1–3 years of age (Behrman and Hoddinott 2000). The program appears well-targeted and welfare-augmenting for both short- and long-term indicators of welfare.

Most of the social safety-net programs currently in place in northwest Bangladesh aim to help beneficiaries cope with seasonal deprivation specifically and longer-term poverty more generally. This paper aims to assess the effectiveness of these programs in mitigating monga. Specifically, it examines programs' coverage in the greater Rangpur area and their impact on food-consumption patterns of poor households during monga and non-monga periods. The analysis shows that social safety-net programs, especially those administered by NGOs, are helpful in mitigating seasonal, as well as year-round, food deprivation. The extent of NGO outreach is twice that of government programs (about 20 percent versus 10 percent of the hard-core poor), which

may explain why NGOs are more effective in mitigating seasonal deprivation in the northwest region.

2. Social Safety-net Operations in Bangladesh

With annual per capita GDP growth at 6 percent over the past decade, Bangladesh has attained a substantial decline in headcount poverty. In the early 1990s, headcount poverty was at 57 percent; the 26-percent decline over the subsequent 20 years (to 49 percent by 2000 and 31.5 percent by 2010) occurred mainly in rural areas (35.2 rural versus 21.8 percent urban) (Table 1). This is indeed a remarkable achievement for a country with a population of just 160 million.

{TABLE 1 HERE}

Despite this progress, an estimated 56 million people—the approximate population size of the UK or France—remain impoverished in Bangladesh. With a population growth rate of 1.5 percent, creating adequate employment opportunities has been a major challenge. A large share of per capita expenditure is clustered around the poverty line, meaning that vulnerability to poverty, hunger, and economic insecurity is high and increasingly common for the poor. Moreover, such shocks as Cyclone Sidr in 2007 and food- and fuel-price increases during early 2008 are likely to have increased poverty (World Bank 2010).

{TABLE 2 HERE}

In addition, Bangladesh's poverty-reduction performance is not uniform across the country. Although overall poverty has declined, incidence of poverty is much higher in lagging regions. For example, in 2005, the poverty rate was 40 percent country-wide, compared to 57.4 percent in the greater Rangpur region, which is also more vulnerable to natural disasters. In addition to regional disparity, poverty varies by season. Again, the greater Rangpur region exhibits the most pronounced

seasonal variation in poverty (Table 2) (Khandker 2011). Thus, it is an enormous challenge for Bangladesh to safeguard the economic security of the poor, especially in greater Rangpur.

2.1 Bangladesh's Safety-net Programs

The Government of Bangladesh (GOB) implements its safety-net programs through various ministries, state divisions, and sometimes in collaboration with international donor organizations. One way to categorize these programs is by their duration. For example, the GOB has both long- and short-term social safety-net measures. Short-term or seasonal programs provide poor households quick or emergency cash or food support to minimize the impact of natural disasters. Examples of such interventions are Food for Work (FFW) and Cash for Work (CFW). Long-term programs, on the other hand, are continuous measures that offer both cash and food support throughout the year. Examples are the Employment Generation Program for the Poorest (EGPP), Vulnerable Group Development (VGD) and Vulnerable Group Feeding (VGF). Among these programs, EGPP specifically address seasonal vulnerability and is one of the largest public safety net programs in Bangladesh.

VGD, a collaborative intervention jointly managed and implemented by the GOB and the World Food Program, is the world's largest development intervention of its kind (Ahmed et al. 2009). Begun in 1975 as a relief program for families affected by natural calamities, the program today targets rural women exclusively, integrating food security and nutrition with development and income generation. In 2005–06 alone, some 750,000 ultra-poor rural women received program support. The generic VGD program operates through two components: Income Generation for Vulnerable Group Development (IGVGD), which covers 85 percent of total VGD beneficiaries, and Food Security for Vulnerable Group Development (FSVGD), covering 15 percent of VGD

beneficiaries. In addition to government support, NGOs and private organizations also contribute significantly to the country's safety-net effort.

Beyond the better-known programs mentioned above, other successful programs include the older, ongoing Rural Maintenance Program (RMP), originally introduced in 1983 by CARE and now under the Ministry of Local Government, Rural Development and Cooperatives. The RMP is a cash-for-work program that provides four years of employment in rural-roads maintenance to female heads of households who are divorced, widowed, separated, or abandoned with little or no financial support. Each RMP participant receives a wage of Tk.51 per day for 30 days in a month. The program disburses cash wages through direct transfers to participants' bank accounts. The compulsory savings requirement is Tk.10 per day, which is deducted by the banks before salaries are paid. The savings can be withdrawn by the participants only after completing the four-year cycle. Besides providing cash, the RMP offers participants life-skills trainings, including the development of business skills; as well as health, nutrition, and women's rights counseling.

In February 2002, the GOB and WFP together introduced a new program, entitled Integrated Food Security (IFS), which has three components: Food for Asset Creation (FFA), Community Nutrition Initiative, and Training and Nutrition Centers (Ahmed et al. 2009). The FFA component promotes human- and capital-resource development for the ultra-poor by (i) providing awareness and training in legal, social, health, and nutrition issues; (ii) enabling participants to work for community infrastructure development and productive asset creation; and (iii) providing marketable skills training for income-generating activities (IGAs). It is required that at least 70 percent of participants be women who are not already VGD beneficiaries. FFA participants receive food and cash compensation for infrastructure development work at various times of the year. Food and cash for work are usually provided from December to May, which is seasonally suitable for infrastructure development. Entitlement for such work is a minimum wage of 2 kg of rice or

wheat and Tk.15 per working day, provided a minimum amount of work is done. Training in awareness-raising and IGAs is conducted from June to November. A participant's monthly entitlements for the training period are 20 kg of wheat or rice and Tk. 100. Similar to the participant requirements of the IGVGD and FSVGD, saving is compulsory. FFA participants are required to save Tk. 25 per month. FFA follows a 12–24 month project cycle. Although systematic program evaluations are seldom done, available research suggests that cash-transfer programs have helped to alleviate food and health insecurity, and in some cases have enabled beneficiaries to invest in small-scale IGAs.

{TABLE 3 HERE}

A study of the International Food Policy Research Institute (IFPRI) demonstrates that, out of four programs (IGVGD, FSVGD, FFA, and RMP), transfer as a percentage of household expenditure is highest for FFA, at 38.2 percent, followed by RMP (30.2 percent), IGVGD (15.5 percent), and FSVGD (15.0) (Ahmed et al. 2009). The same study finds that, among the four programs, FFA is the best targeted, helping 72 percent of its beneficiaries lift themselves above the poorest 10 percent of the population. Using data from the 2000 and 2005 Household Income and Expenditure Surveys (HIESs), Khandker (2011) finds that VGF lowers poverty among its beneficiaries, and that such programs as FFW lower both seasonal and chronic poverty (Table 3).

2.2 Meeting the Safety-net Need

Given Bangladesh's wide range of safety-net programs, are there enough to meet its needs? Driven by rapid urbanization and the breakdown of the extended family system, the country now faces new social-protection challenges, even as it struggles to tackle ongoing ones. Most existing safety-net programs target the rural poor; thus, there is an urgent need to address the problems of the urban poor and other excluded groups, including the disabled and street children. The GOB spent less

than 1 percent of GDP on social safety-net programs till the end of 1990s, which was less than the 2 percent allocated in Sub-Saharan Africa and far less than the 5 percent average allocation in South Asia (World Bank 2006, 2008). However, the allocation has improved recently – GOB has allocated 2.8 percent of the GDP on food-based safety net programs alone in FY09 budget (World Bank 2008). In addition to the various GOB-supported safety-net programs shown in Table 4, the government also allocates substantial resources each year to natural-disaster relief programs. Over the 12-year period shown in Table 4, safety-net allocations have expanded significantly. That expansion has been mostly due to increase in the VGD, VGF and GR and TR programs, although the budget in FFW has declined.

{TABLE 4 HERE}

Government safety programs usually reach about 4–5 million households according to the World Bank report on the safety net programs in Bangladesh (World Bank 2006). The report finds that approximately 10 percent of the poor are covered by a large number of programs. However, the situation seems to have improved over the last few years. According to HIES data for 2005, national coverage of the social safety-net programs is only 13 percent (with 15.6 percent in the rural areas and only 5.5 percent in urban ones). The same survey in 2010 finds the national coverage to have almost doubled to 25 percent (with the rural and urban coverage being about 30 percent and 9 percent respectively). While coverage is highest for the VGD and VGF programs (just under 7 percent), the average benefit households receive from these programs is less than Tk.1000 (Figure 1). Conversely, the IFS program offers high average benefits, but coverage is quite low.

{FIGURE 1 HERE}

{FIGURE 2 HERE}

Until 2003–04, the government's allocation for both seasonal and year-round safety-net programs was fairly low and about the same, after which time the allocation to seasonal programs rose considerably, reaching Tk. 6 million per year by 2007–08, more than 10 times the amount allocated in 2003–04. Over the same period, allocation to year-round programs increased by only half (Figure 2). Thus, the relative importance of short-term versus longer-term programs is a point worth exploring.

3. Survey and Data Description

This study is based on a large household survey conducted in the greater Rangpur region in 2006–07 by the Institute of Microfinance (InM), with support from the Palli Karma Shahayak Foundation (PKSF), Bangladesh's wholesale outlet for microfinance. The InM survey aimed to identify the hard-core poor, the group most vulnerable to monga, and to design and implement appropriate mitigating interventions.[1] The survey covered roughly 70 percent of rural residents in the greater Rangpur region,[2] and was conducted immediately following the 2006 monga season (September–November). A total of 482,928 households were surveyed, representing 23 sub-districts (*upazilas*) and some 2,300 villages; after data cleaning, 480,918 households were retained for the purpose of this paper's analysis. Survey data on the extent of seasonal food deprivation and coping mechanisms adopted by the poor to mitigate it were limited.

The survey characterized poor households in the greater Rangpur region by a high dependency ratio (0.63), a high rate of wage employment (54 percent), and a low rate of self-employment (16 percent) (Table 5).[3] Since most of the poor are wage employed in the agriculture

[1] In the InM survey, the hard-core poor are defined as those households that own less than half an acre of land, whose monthly incomes do not exceed Tk. 1,500 (equivalent to US$22), or who sell labor for a daily wage.
[2] The InM survey covered all five of the greater Rangpur region's districts: Kurigram, Gaibandha, Nilphamari, Lalmonirhat, and Rangpur.
[3] The dependency ratio is measured by a household's proportion of non-working members.

sector, they are likely to suffer the most from seasonality of agriculture. As Table 5 shows, only 13 percent of the poor have non-agricultural assets (e.g., rickshaw van), and about 49 percent have some type of agricultural asset (e.g., plough). However, the poor are virtually landless (the average landholding is less than one-tenth of an acre). These characteristics vary little across the region's five districts.

{TABLE 5 HERE}

As mentioned above, both government and nongovernmental safety-net programs assist those rural poor who are vulnerable to the seasonality of monga and, in response, tend to adopt desperate coping measures. Given the extent of the crisis, however, it appears that government support is inadequate. An examination of the government's main social safety-net programs—VGD, VGF, and Old Age Pension—reveals that only about 10 percent of rural households are covered (Figure 3). Program coverage appears somewhat misplaced, with Kurigram, considered the most impoverished among the five districts, receiving the lowest coverage. Among the three programs, VGD and VGF have the highest coverage (6.3 percent), which is still quite inadequate.

{FIGURE 3 HERE}

Membership in safety-net programs does not necessarily guarantee that households receive support during the monga season. Safety-net programs are grouped into short- and long-term programs (Table 6). Only 9.6 percent of the rural poor are members of government-run, safety-net programs; about one-third of them receive no support from these programs during the monga period. However, most members receive support from long-term, safety-net programs. On the other hand, about one-quarter of the ultra-poor receive support from government-run, safety-net programs during the monga season, even though they are not members. In sum, only 31.6 percent of the rural ultra-poor receive some form of government help during the monga period.

{TABLE 6 HERE}

Given the inadequacy of safety-net support from government-run programs during monga, vulnerable households adopt a variety of coping mechanisms. As Table 7 suggests, some 57 percent of safety-net program recipients adopt some type of coping measure, compared to 49 percent among non-recipients. Among members of government safety-net programs, about 55 percent adopt informal coping mechanisms (e.g., advance sale of labor or crop) and 6.5 percent adopt formal means (e.g., borrowing from formal sources). Seasonal migration is the major informal coping mechanism for the poor in the greater Rangpur region: 38.6 percent of safety-net program recipients and 34.8 percent of non-recipients adopt out-migration as a coping measure, suggesting that both groups remain equally vulnerable to monga.

{TABLE 7 HERE}

We next examine the extent of the hardship that households in the greater Rangpur region are subjected to during the monga period. The InM survey lacks data on household food consumption; rather, it has an indicator variable reporting the status of meal consumption of the sampled households, as follows: (i) starvation (households go without meals for a day or more), (ii) meal rationing (households consume less than what they normally would in a day), and (iii) full meal consumption (households consume desired quantity of meals, which is usually three a day). This information was collected from all households for both monga and non-monga periods.

A high percentage of the rural ultra-poor in the greater Rangpur region, with the exception of Nilphamari District, experienced starvation during the 2006 monga season (Table 8). Overall, about 47 percent of poor households experienced starvation during monga, while only 4.4 percent had full meals during the same period. Predictably, the rate of starvation during the non-monga period declined; however, it did not fall to zero; even during the non-monga season, 8.5 percent of households experienced starvation. On the other hand, the share of households that consumed full

meals rose to nearly 41 percent. Also, about half the population rationed meals in both seasons, indicating a persistent form of food insecurity among the hard-core poor in the greater Rangpur region.

{TABLE 8 HERE}

Does meal-consumption status vary by membership in safety-net programs or whether a household receives support during monga? At the aggregate level, 49.9 percent of recipient households and 46.1 percent of non-recipient households underwent occasional starvation during the 2006 monga (Table 9), meaning that the extent of seasonal deprivation was slightly higher among safety-net beneficiaries, compared to non-beneficiaries. This does not necessarily imply a negative effect of the safety-net programs, but merely indicates that safety-net beneficiaries are more vulnerable than their counterpart non-beneficiaries.

{TABLE 9 HERE}

{TABLE 10 HERE}

During the non-monga season, the rate of starvation was lower among safety-net beneficiaries, compared to non-beneficiaries (Table 10). Again, this does not necessarily imply a positive impact of the safety-net programs. An impact assessment, discussed later in this paper, is required to handle the endogeneity issues regarding program placement and participation in the safety-net programs.

4. Determinants of Safety-net Support in Northwest Bangladesh

As mentioned previously, the InM survey aimed to collect information on the hard-core poor in Bangladesh's greater Rangpur region. The targeting criteria (listed in footnote 1), according to the InM, were well enforced, but we cannot completely verify that claim as data on the monthly-income

criterion was not collected. We find that, during the monga period, less than one-third of the sampled households actually received benefits from one or more safety-net programs. This finding perhaps has little to do with targeting efficiency, and is related more to constrained resources: There are simply not enough safety-net resources to provide for all who deserve it. Thus, a key question is what determines household access to any safety-net program. In this section, we examine various factors that might determine whether a household receives safety-net benefits.

Because receipt of safety-net benefits can be represented as a binomial variable, a probit model is used to estimate it, which is expressed as follows:

$$prob(s=1) = \int_{-\infty}^{\beta X} \phi(t)dt = \Phi(\beta X), \qquad (1)$$

where ϕ and Φ are the normal density distribution and the cumulative normal distribution functions, respectively; X is a vector of household and community characteristics; and β is the vector of parameters to be determined. Both household- and village-level characteristics are likely to affect the receipt of safety-net benefits during the monga season. Among household-level factors, we consider various types of household assets, dependency ratio, and the age and education of household head. The village-level variables include access to microcredit programs and the unemployment rate.[4] Moreover, we use several other location and agroclimate factors that can affect households' vulnerability to monga and whether they are recipients of the safety-net resources disseminated: (i) average yearly rainfall at the upazila (sub-district) level, (ii) proportion of high land in the upzila,[5] and (iii) whether the village is located in a char area.[6] Finally, we control for

[4] The rate of village-level unemployment has been defined by the proportion of households in the village whose heads are unemployed.
[5] According to the Bangladesh Agricultural Research Countil (BARC), a high land area is one where the flood-water level remains below a height of 3 feet.
[6] A char is a land area formed by river sediments that is then inhabited by homeless, destitute people.

unobserved characteristics at the union level (rural micro areas below the upazila level) that may influence the probability of receiving safety-net benefits during the monga season.

{TABLE 11 HERE}

The probit results of equation (1) are reported in Table 11, which also presents the descriptive statistics of the major explanatory variables used in the regression. Such household-level variables as household head's age and employment status, non-agricultural assets, and savings matter in terms of accessing social safety-net support. For example, having a self-employed head reduces the household's probability of receiving safety-net benefits during monga by 10.3 percent, while ownership of non-agricultural assets reduces it by 3 percent. Conversely, having some household savings increases the probability of access to safety-net support. Finally, households in a village with high unemployment are likely to receive more benefits than those in a village with low unemployment. Households in a high-rainfall area, indicative of better agricultural opportunities, are likely to receive more benefits during monga. Similarly, within the same rainfall area, those upazilas with a greater share of high lands are likely to receive more benefits. However, having char land, an indicator of a village's increased vulnerability due to poor agroclimate conditions, apparently does not influence deciding who receives support during monga. But once the program is in place, having landholdings reduces the recipient's safety-net support in areas with high land, high rainfall, and char land. Thus, the findings confirm that safety-net programs are not well targeted to vulnerable areas, even though poor households are likely to benefit more once villages gain access to the programs. Support to the northwest region's ultra-poor during monga is simply not enough, as evidenced by the 70 percent who receive no support at that time.

5. Estimating Program Impacts

Given the coverage and size of and access to social safety-net schemes supported by both the government and NGOs, we raise an important policy question: Do safety-net programs help to alleviate starvation? Constructing a counterfactual is key to answering this policy question and evaluating the intervention; that is, what would have happened to the starvation status of safety-net program beneficiaries had they not received such support? Randomized design of an ex-ante intervention, where beneficiaries are treated randomly with a program intervention, can help to create the counterfactual against which this key policy question can be evaluated. IFPRI, in collaboration with the Mexican government, adopted such a rigorous, randomized evaluation technique to evaluate PROGRESA's impact on education, nutrition, health, and rural poverty. This evaluation was also based on repeated surveys of individuals from 24,000 households in 506 localities in randomly assigned PROGRESA and non-PROGRESA areas. Formal surveys, structured and semi-structured interviews, focus groups, and workshops were held in seven states where the program was first piloted. However, such an extensive and innovative evaluation design is beyond the scope of this study.

In the absence of randomized design, we can rely on non-randomized evaluation techniques. For example, Ahmed et al. (2009) applied a propensity score technique to a cross-sectional survey of safety-net beneficiaries and non-beneficiaries to determine program effects based on observed characteristics. The weakness of this method is that it omits the bias due to unobserved characteristics influencing participation in safety-net programs. A more defensible non-randomized method that accounts for the unobserved-variable bias is panel data, where the key assumption for identification is that unobserved heterogeneity is time invariant. Ravallion, van de Walle, and Gautam (1995) used this method in their study of safety-net programs in Hungary. Unfortunately, we do not have panel household survey data for handling this endogeneity.

What we do have is cross-sectional, ex-post data on recipients and non-recipients of safety-net programs in the greater Rangpur region for both monga and non-monga periods. With this data, we can compare such outcomes as starvation status between recipients and non-recipients; however, we cannot establish causality between receiving the safety-net program and food deprivation. Since a household's seasonal food deprivation also depends on a host of other factors, it is important to control for all such factors (both observed and unobserved) to determine the impact of safety-net programs on seasonal hardship. This is the challenge of an ex-post program evaluation using cross-sectional survey data.

In our evaluation scenario, we know only that less than one-third of the hard-core poor in the greater Rangpur region received the benefit of the social safety-net program during the 2006 monga season due to supply-side constraints. Household receipt of the safety-net program benefits is not exogenously given. To control for endogeneity of program benefits, we could use an instrumental variable regression technique, which requires one or more suitable instruments. Such instruments would directly affect household receipt of safety-net benefits, but not seasonal food deprivation, which would only benefit indirectly through safety-net program benefits. However, deciding on the appropriate instruments is not an easy task, and we do not have valid instruments to use in the instrumental variable method. Alternately, we propose a two-step procedure that uses the endogenous switching regression proposed by Maddala (1983) to control for endogeneity of safety-net program benefits with induced outcomes of our interest, such as extent of seasonal deprivation.

5.1 Model Description

We assume that s_i denotes whether household i receives safety-net benefits during the monga season ($s_i = 1$ when household receives benefits, 0 when it does not), which is determined by the following selection model:

$$\text{if } \gamma Z_i + u_i > 0, \text{ then } s_i = 1 \qquad \text{and} \qquad (2)$$

$$\text{if } \gamma Z_i + u_i \leq 0, \text{ then } s_i = 0, \qquad (3)$$

where Z_i is a vector of household- and village-level characteristics that determines whether a household receives safety-net program benefits during the monga season, γ is the parameter to be estimated, and u_i is the error term. We further assume that seasonal food deprivation of the recipients and non-recipients is expressed, as follows:

$$C_{1i} = \beta_1 X_{1i} + \varepsilon_{1i}, \text{ when a household benefits from the safety net } (s_i = 1) \qquad (4)$$

$$C_{0i} = \beta_0 X_{0i} + \varepsilon_{0i}, \text{ when a household does not benefit } (s_i = 0), \qquad (5)$$

where X_{1i} and X_{0i} are vectors of household- and village-level characteristics that determine a household's food consumption when the household receives safety-net benefits and when it does not, respectively; β_1 and β_0 are parameters to be estimated; and ε_1 and ε_0 are the error terms. The outcome equations include all the X variables used in the probit equation for receiving safety-net benefits, including the dummy variables for union to control for any local-level heterogeneity. The error terms, u_i, ε_1, and ε_0 are assumed to have a tri-variate normal distribution, with mean vector zero and covariance matrix, as follows:

$$\Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{01} & \sigma_{1u} \\ & \sigma_0^2 & \sigma_{0u} \\ & & \sigma_u^2 \end{bmatrix}$$

where, σ_u^2, σ_1^2, and σ_0^2 are the variances of u_i, ε_1, and ε_0, respectively; and σ_{1u}, σ_{0u}, and σ_{01} are covariances of ε_1 and u_i, ε_0 and u_i, and ε_0 and ε_1, respectively. In a switching regression model, outcome equations are run after controlling for a household's selection bias.

5.2 Outcomes Measuring Seasonal Food Deprivation

From the food-consumption pattern of the households, we derive two outcomes measuring seasonal food deprivation. The first one is starvation, which is an extreme form of hardship. The second, general food deprivation, is constructed by combining starvation and meal rationing; that is, a household undergoes general food deprivation if it starves or rations meals.

As Table 12 illustrates, a household's land and various non-land assets reduce its probability of seasonal food deprivation, regardless of whether it receives safety-net program support. For example, a 10-percent increase in land assets reduces seasonal starvation by 3.6 percentage points and general food deprivation by 0.9 percentage points for recipients of safety-net benefits. Similarly, it is observed that land assets reduce seasonal starvation for non-recipients of safety-net benefits, albeit to a lesser extent. Having a self-employed household head lowers a safety-net recipient's probability of starvation during monga by 4.9 percentage points, without affecting other outcomes. Having a wage-employed head, on the other hand, increases general food deprivation during monga for both recipient and non-recipient households. Among the location characteristics, being situated in an area with high land or adequate rainfall reduces a household's seasonal deprivation, regardless of the status of its safety-net benefit.

{TABLE 12 HERE}

In addition to regression coefficients, Table 12 reports σ_1, σ_0, ρ_1, and ρ_0, where the last two terms are the correlation coefficients between ε_1 and u_i, and ε_0 and u_i, respectively. The same signs of ρ_1 and ρ_0 indicate that the unobserved factors that influence a household's probability of receiving safety-net benefits also affect its seasonal food deprivation in the same way; the opposite signs of ρ_1 and ρ_0 indicate that unobserved factors have opposite effects on a

household's probability of receiving safety-net benefits and food deprivation status. Table 12 also reports the inverse Mill's ratio (λ), which estimates the normal density function over the cumulative density function of the variable Z or $\frac{\varphi(\gamma Z)}{\Phi(\gamma Z)}$, calculated from the first-stage equation. The inclusion of λ in the outcome equation controls for the unobserved factors (endogeneity bias) that influence a household's probability of receiving safety-net benefits in the first place. Since λ is highly statistically significant, the dependent variable (a household's starvation and general food deprivation) is indeed affected by the endogeneity of safety-net support.

5.3 Program Effects on Seasonal Food Deprivation

While we have shown in Table 12 the determinants of seasonal food deprivation for recipients and non-recipients of safety-net support, we have not yet shown the potential impacts of safety-net support on seasonal food deprivation. To do so, we construct, in accordance with the derivation of Lokshin and Sajaia (2004), the following terms:

$$yc_{1\_1i} = E(y_{1i} \mid s = 1, x_{1i}) = x_{1i}\beta_1 + \sigma_1\rho_1\phi(\gamma Z_i)/\Phi(\gamma Z_i)$$

= conditional expected value of seasonal food deprivation of a recipient household (i.e., it received the safety-net benefits);

$$yc_{0\_1i} = E(y_{0i} \mid s = 1, x_{1i}) = x_{1i}\beta_0 + \sigma_0\rho_0\phi(\gamma Z_i)/\Phi(\gamma Z_i)$$

= conditional expected value of seasonal food deprivation of a recipient household had it not received the safety-net benefits, (counterfactual);

$$yc_{0\_0i} = E(y_{0i} \mid s = 0, x_{0i}) = x_{0i}\beta_0 - \sigma_0\rho_0\phi(\gamma Z_i)/[1-\Phi(\gamma Z_i)]$$

= conditional expected value of seasonal food deprivation of a non-recipient household (i.e., it did not receive the safety-net benefits); and

$$yc_{1\_0i} = E(y_{1i} \mid s = 0, x_{0i}) = x_{0i}\beta_1 - \sigma_1\rho_1\phi(\gamma Z_i)/[1 - \Phi(\gamma Z_i)]$$

= conditional expected value of seasonal food deprivation of a non-recipient household had it received the safety-net benefits (counterfactual).

Here ϕ and Φ are the normal density distribution and cumulative normal distribution functions, respectively.

Based on the above calculations, we construct the impacts of safety-net program benefits on household outcomes, as follows:

$$yc_{\_1i} = yc_{1\_1i} - yc_{0\_1i} =$$

[expected outcome of recipient household – expected outcome of recipient household had it not received the benefits (counterfactual)] = change in outcome of a migrant household due to safety-net program benefits.

$$yc_{\_0i} = yc_{1\_0i} - yc_{0\_0i} =$$

[expected outcome of a non-recipient household had it received the safety-net benefits (counterfactual) – expected outcome of a non-recipient household] = change in outcome of a non-recipient household due to safety-net program benefits had it received such benefits.

We can also compare the expected outcome gains between recipient and non-recipient households by taking a second-order difference, expressed as follows:

$$yc_{\_i} = yc_{\_1i} - yc_{\_0i}$$

From the counterfactual comparison, it is obvious that safety-net support reduces seasonal hardship for both recipient and non-recipient households (Table 13). The expected reduction in monga-time starvation for recipient households is 4.4 percentage points (which are accrued to them)

and 2.5 percentage points for non-recipient households (which would have accrued to them had they received safety-net benefits). Similarly, a household's general food deprivation during the monga period decreases by 3.9 percentage points for recipient households and by 5.2 percentage points for non-recipient households as a result of having received safety-net benefits.

{TABLE 13 HERE}

An important finding from this analysis is that the accrued benefit to recipient households is higher than that to non-recipient households for starvation, while for general food deprivation non-recipients appear to have benefited more. This clearly points to the underlying differences between recipient and non-recipient households. Regardless of household type, however, this exercise unequivocally establishes the benefits of safety-net programs with regard to seasonal food deprivation. Extending the analysis to estimating potential impacts on non-monga outcomes, we find from the similar results presented in Table 13 that safety-net access reduces starvation by 1.2 percentage points and general deprivation by 0.4 percentage points.

5.4 Measured Benefits and Support Type

Thus far, we have not differentiated between government and NGO interventions to support the ultra-poor in the greater Rangpur region during the monga season. As previously mentioned, government programs account for only 10 percent of coverage, while NGO coverage is more than twice that amount, at 21 percent. Thus, we questioned whether the measured benefits resulted from NGO support. To answer this question, we repeated our exercise by limiting the samples first to households who were beneficiaries of government-supported programs and second to those who were not (excluding those who received NGO support) (Table 14).

{TABLE 14 HERE}

The results suggest that membership in government-supported programs contributes little to reducing starvation during monga, but does help to reduce hunger during the non-monga period. Perhaps this explains why safety-net support during monga was insufficient to substantially reduce seasonal hardship, but did help to alleviate it, albeit inadequately, during the non-monga period. Nonetheless, both sets of results clearly show that safety-net programs affect both transitory and chronic poverty, which is consistent with the findings of Devereux (2002) for poor African countries and unlike those of Ravallion, van de Walle, and Gautam (1995).[7]

6. Summary and Conclusion

The basic objective of this paper has been to assess the role of social safety-net programs in mitigating seasonal deprivation (monga) using recent survey data of hard-core poor households in the greater Rangpur region of Bangladesh. We have also explored whether safety-net programs, which are overwhelmingly seasonal in nature, can avert the consequences of seasonal shocks or seasonality of income and employment. Although the extent of program coverage is limited by the availability of funds, we find that programs, where in place, are well-targeted. However, program inputs are not distributed in accordance with the perceived notion of area-specific poverty incidence. We also find that some programs, such as Old Age Allowance, are year-round, reaching the most vulnerable groups (e.g., the elderly). Interestingly, the distribution of program benefits is not random but is determined by a host of factors, including a household's physical and human assets, plus the availability of alternative programs (e.g., microfinance in the vicinity of potential program beneficiaries).

Interestingly, the results of our impact assessments show that safety-net programs have a positive effect on mitigating monga. More importantly, the programs mitigate both seasonal and

[7] We also tried to differentiate the potential effects of short-term versus long-term safety-net measures; however, the sample size for long-term measures was too small to run separate regressions and thus separate estimates.

non-seasonal starvation. These findings are consistent with those of IFPRI in Mexico and Devereux in African countries. Given the effectiveness of these programs, it is probably correct to argue that their coverage should be expanded; that is, program deepening should be increased. We also find that NGO participation has made it possible to expand program coverage in the greater Rangpur region in recent years. Even so, there is a need to deepen programs in terms of both coverage and size. This is apparent, given that households are found to adopt other methods besides social safety nets to cope with seasonal deprivation. Moreover, the expansion of government-supported social safety-net programs can effectively contribute to mitigating monga, provided such programs are well-coordinated with those of NGOs.

Since the annual recurrence of monga in Bangladesh's greater Rangpur region is a function of the seasonality of agriculture, the safety-net approach may not offer a permanent cure. Also needed are ways to enhance the income and productivity of the poor through income diversification that includes rural non-farm income, as well as remittances from seasonal out-migration. At the same time, investments in physical infrastructure and human capital must be increased to facilitate the transition to a more diversified economy. In sum, social safety nets can be viewed as a quick fix to reduce the severity of seasonal deprivation in the northwest region, but the longer-term solution rests on promoting the income and productivity of the poor.

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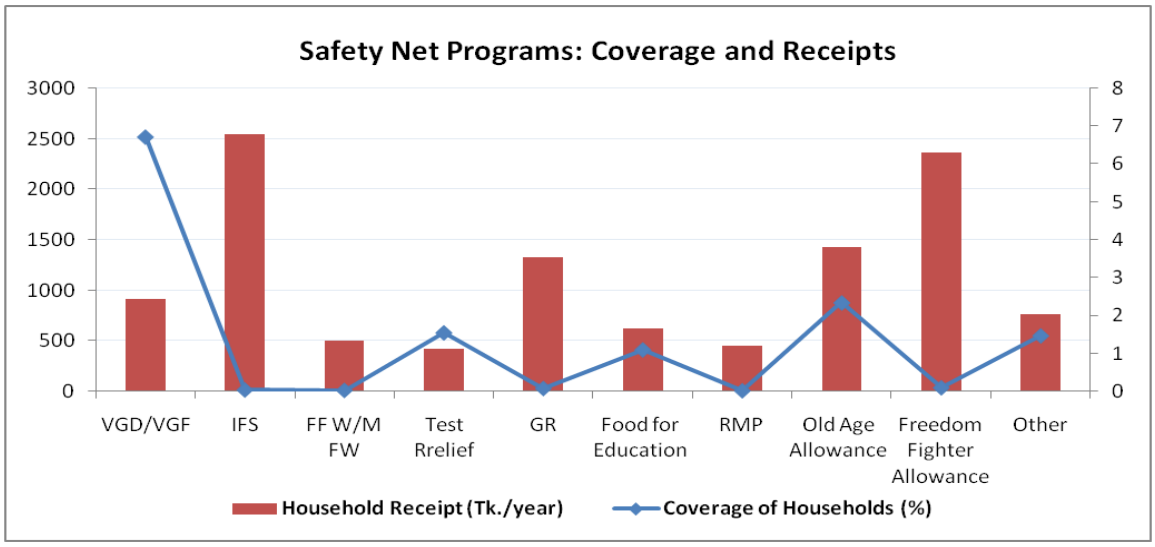
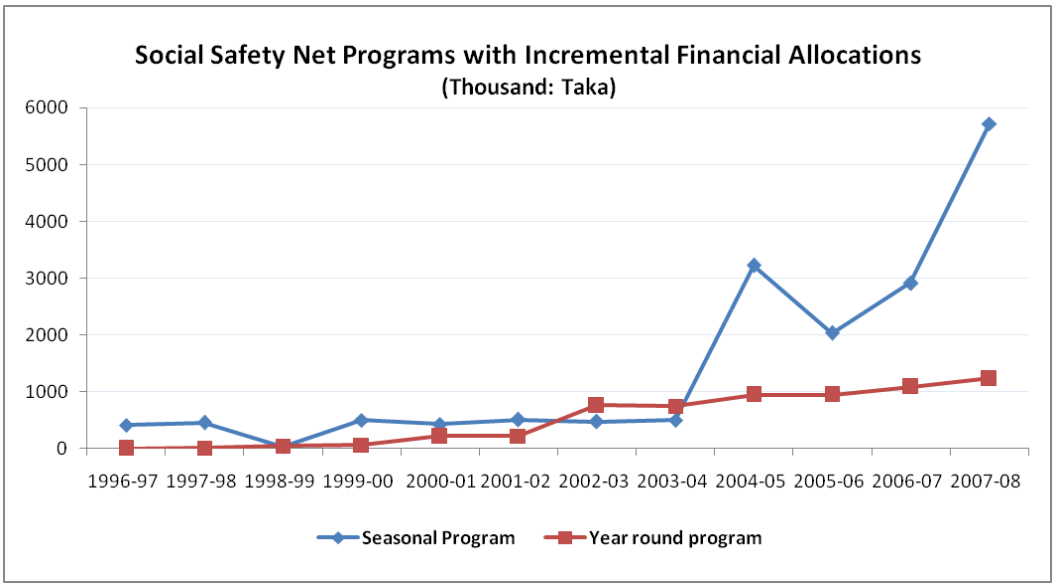
Figures

Figure 1: Safety-net program coverage



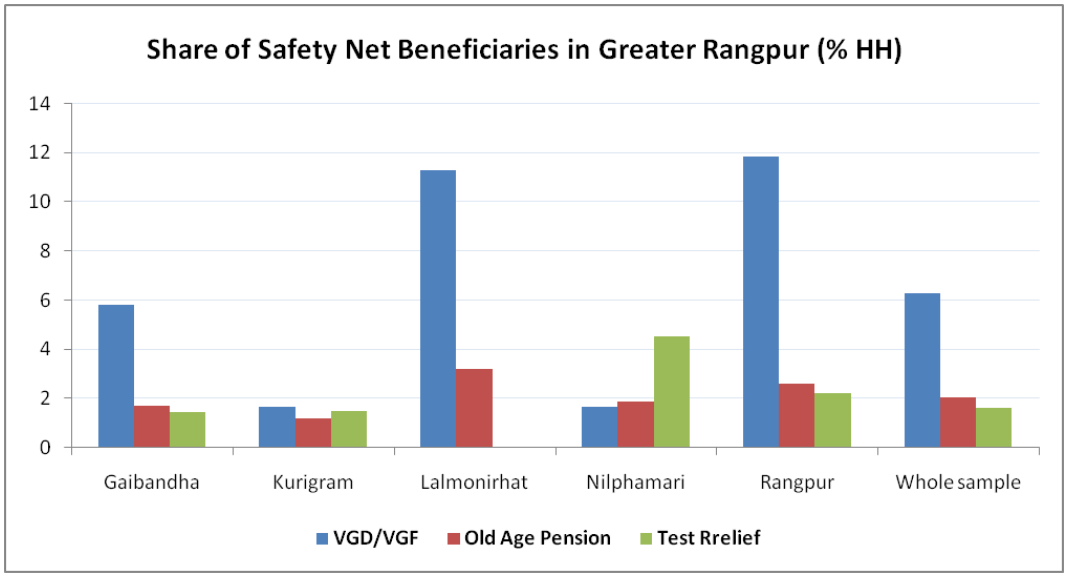
Source: HIES (2005).

Figure 2: Trend in yearly allocation for seasonal and year-round safety-net programs



Source: Ministry of Finance, Bangladesh.

Figure 3: Coverage of government safety-net programs in greater Rangpur



Source: InM survey (2006–07).

Tables

Table 1: Incidence of poverty and extreme poverty, by area

Area	Poverty headcount (%)		Extreme poverty headcount (%)	
	2000	2010	2000	2005
Whole country	48.9	31.5	34.3	17.6
Rural	52.3	35.2	37.9	21.1
Urban	35.1	21.3	19.9	7.7
Greater Rangpur	67.7	42.3	55.9	27.7

Sources: HIES (2000, 2010).

Table 2: Distribution of rural food poverty and extreme poverty, by season

Season	Greater Rangpur (%) 2000	2005	Rest of country (%) 2000	2005	Whole country (%) 2000	2005
Monga	FP = 93.0	FP = 88.3	FP = 86.4	FP = 83.4	FP = 86.9	FP = 83.8
	EP = 66.0	EP = 48.3	EP = 43.9	EP = 31.6	EP = 45.6	EP = 33.0
Non-monga	FP = 79.5	FP = 76.8	FP = 79.6	FP = 76.3	FP = 79.6	FP = 76.4
	EP = 52.3	EP = 43.0	EP = 38.4	EP = 28.6	EP = 39.7	EP = 29.9
Year-round	FP = 82.6	FP = 79.5	FP = 81.5	FP = 78.2	FP = 81.6	FP = 78.5
	EP = 55.5	EP = 44.2	EP = 39.9	EP = 29.4	EP = 41.8	EP = 31.1
No. observations	440	520	4,600	5,520	5,040	6,040

Source: Khandker (2011).
Note: FP = food poverty, EP = extreme poverty.

Table 3: Bangladesh's major safety-net programs

Program	Beneficiary group	Requirement	Cash/ kind	Key features
Rural Maintenance Program (RMP)	Women able to work	Work	Cash	Public works program; average payment of Tk. 43 per day.
Primary Education Stipend Project (PESP) (formerly Food For Education [FFE])	Households	Schooling	Cash	Program to promote school enrollment and attendance, reduce dropout rate, and improve educational quality.
Female Secondary School Assistance Program (FSSAP)	Households	Schooling	Cash	Program to promote and encourage continuing education for females.
Old Age Allowance	Households with elderly members unable to work without pension or income	No work requirement	Cash	Allowance to reduce vulnerability of households with elderly members in non-municipal areas; average payment is Tk. 165 per month.
Food for Work (FFW)	Individuals able to work	Work mostly in infrastructure development projects	Food grain	Food transfer program to reduce food vulnerability among the poor; in 2003, provided food in exchange for some 75 million hours of work.
Test Relief	Individuals able to work	Work mostly to support such activities as cleaning ponds and bushes	Food grain	Food transfer program to reduce food vulnerability among poor individuals and households in rural areas; much smaller program than FFW.
Vulnerable Group Development (VGD)	Households	No work requirement	Food grain	Food transfer program that trains vulnerable groups in life and work skills; as of June 2004, had provided food to some 480,000 households.
Vulnerable Group Feeding (VGF)	Households	No work requirement	Food grain	Food transfer program that offers post-disaster food relief to selected households; during the 1998 flood, about 6 million households benefited.
Gratuitous Relief (GR)	Households	No work requirement	Food grain	Key government, food-transfer program offering vulnerable groups immediate, short-term relief following natural and other disasters; much smaller program than the VGD or VGF.

Source: World Bank (2006).

Table 4: Financial allocations for major safety net programs (Million Tk.)

Program	1999-00	2001-02	2003-04	2005-06	2007-08	2009-10	2011-12
Food for Work (FFW)	8,060	6,728	2,047	2,197	2,609	5,097	6,224
Gratuities Relief (GR) & Test Relief (TR)	2,280	2,319	1,896	2,687	3,019	5,839	6,784
Vulnerable Group Development (VGD)	2,720	2,367	1,751	2,447	2,859	3,270	3,681
Vulnerable Group Feeding (VGF)	2,290	1,250	1,490	1,883	5,643	6,028	7,840
Allowance for Widow	250	239	777	1,022	1,522	1,820	1,616
Honorarium for Freedom Fighters	150	275	155	318	503	1,572	2,090
Old Age Allowance	490	477	1,555	2,385	3,136	4,451	4,346
Primary Education Stipend Project (PESP)	0	954	3,749	3,356	3,270	3,158	4,293

Source: World Bank (2008) and Ministry of Planning.
Note: Allocations are expressed in real terms with base year being 1999-2000.

Table 5: Summary statistics for household characteristics in greater Rangpur, by district

Household characteristic	Kurigram	Gaibandha	Nilphamari	Lalmonirhat	Rangpur	Whole sample
Dependency ratio	0.65	0.64	0.63	0.63	0.57	0.63
Land (decimals)	8.80	8.21	9.71	6.65	6.25	8.20
Has agricultural asset	0.30	0.59	0.55	0.49	0.56	0.49
Has non-agricultural asset	0.16	0.11	0.13	0.11	0.13	0.13
Has savings	0.43	0.34	0.28	0.26	0.32	0.34
Has cow	0.29	0.27	0.30	0.19	0.21	0.26
Head is self-employed	0.21	0.15	0	0.30	0.20	0.16
Head is wage employed	0.44	0.65	0.73	0.57	0.23	0.54
No. observations	120,426	128,987	102,866	56,772	71.867	480,918

Source: InM survey (2006–07).

Table 6: Household distribution in greater Rangpur: Membership in safety-net program versus receipt of support during monga (%)

Status of support received during monga	Member of long-term programs only	Member of short-term programs only	Member of long- and short-term programs	No program membership	All	No. observations
Received support	5.3	0.7	0.1	25.5	31.6	328,601
Did not receive support	2.7	0.8	0	67.9	71.4	152,317
Total	8.0	1.5	0.1	90.4	100.0	480,918
No. observations	38,476	7,143	695	434,604	480,918	

Source: InM survey data (2006–07).
Note: Long-term programs are VGD, VGF and Old Age Allowance; short-term programs are TR and FFW.

Table 7: Coping mechanisms adopted during monga by recipients and non-recipients of safety-net benefits

Coping type	Recipients of support during monga (%)	Non-recipients of support during monga (%)
Informal	**54.6**	**46.4**
Advance sale of labor	6.0	3.6
Advance sale of crop	0.5	0.5
Sale of asset	14.5	9.9
Out-migration	38.6	34.8
Borrowing from informal sources	15.9	10.7
Formal	**6.5**	**5.5**
Borrowing from formal sources	6.5	5.5
Any type	**57.2**	**49.1**
No. observations	**152,317**	**328,601**

Source: InM survey data (2006–007).

Table 8: Household distribution by meal consumption status in greater Rangpur districts (%)

Consumption status	Kurigram	Gaibandha	Nilphamari	Lalmonirhat	Rangpur	Whole sample
Monga period						
Starvation	48.47	57.62	26.16	47.95	56.34	47.27
Meal rationing	50.14	40.79	60.37	49.54	40.35	48.29
Consumption of full meals	1.39	1.59	13.47	2.51	3.31	4.44
Non-monga period						
Starvation	2.08	12.18	2.32	14.36	17.10	8.53
Meal rationing	49.36	63.44	32.89	54.78	53.33	50.85
Consumption of full meals	48.56	24.38	64.79	30.86	29.57	40.62
No. observations	120,426	128,987	102,866	56,772	71.867	480,918

Source: InM survey data (2006–07).

Table 9: Household meal-consumption status during monga by membership status in safety-net program and receipt of support during monga (%)

Support status during monga	Member of long-term program only	Member of short-term program only	Member of long- and short-term programs	No program membership	All
Received support					
Starvation	49.445.1	69.3	51.3	49.4	49.946.1
Meal rationing	5.5	28.7	45.1	46.8	4.0
Full meals		2.0	3.6	3.8	
Did not receive support					
Starvation	42.1	57.440.4	57.841.0	46.1	46.1
Meal rationing	51.3	2.2	1.2	49.3	49.3
Full meals	6.6			4.6	4.6
Total					
Starvation	46.9	63.2	54.343.2	47.0	47.3
Meal rationing	47.2	34.8	2.5	48.6	48.3
Full meals	5.9	2.0		4.4	4.4
No. observations	**38,476**	**7,143**	**695**	**434,604**	**480,918**

Source: InM survey data (2006–07).

Table 10: Household meal-consumption status during non-monga by membership status in safety-net program and receipt of support during non-monga (%)

Support status during monga	Member of long-term program only	Member of short-term program only	Member of long- and short-term programs	No program membership	All
Received support					
Starvation	6.1	15.5	10.0	7.3	7.3
Meal rationing	56.0	57.5	67.0	53.0	53.6
Full meals	37.9	27.0	23.0	39.8	39.1
Did not receive support					
Starvation	7.0	17.1	11.1	9.149.7	9.1
Meal rationing	46.6	45.5	50.3	41.2	49.6
Full meals	46.4	37.4	38.6		41.3
Total					
Starvation	6.4	16.4	10.5	8.5	8.5
Meal rationing	52.8	51.3	59.0	50.7	50.9
Full meals	40.8	32.4	30.5	40.8	40.6
No. observations	**38,476**	**7,143**	**695**	**434,604**	

Source: InM survey data (2006–07).

Table 11: Probit estimates of receipt of safety net support during monga

Explanatory variable	Marginal effect	Mean of explanatory variables
Household level		
Head's age (years)	0.021**	40.0
	(0.001)	(12.7)
Head's age squared	-0.0002**	40.0
	(0.00001)	(12.7)
Dependency ratio	0.031	0.63
	(0.024)	(0.21)
Log of land asset (decimal)	0.296	8.20
	(0.182)	(12.59)
Head is self-employed	-0.103**	0.16
	(0.007)	(0.37)
Head is wage employed	0.012**	0.54
	(0.005)	(0.50)
Has agricultural asset	-0.017	0.49
	(0.013)	(0.50)
Has non-agricultural asset	-0.030**	0.13
	(0.013)	(0.34)
Has cash savings	0.049**	0.34
	(0.010)	(0.47)
Has livestock asset	0.015	0.26
	(0.010)	(0.44)
Village or sub-district level		
Village has microcredit programs	-0.003	0.97
	(0.030)	(0.18)
Village-level unemployment rate	0.115**	0.30
	(0.033)	(0.24)
Proportion of high land in upazila	0.465**	0.81
	(0.137)	(0.08)
Average annual rainfall (mm) in upazila	0.018**	198.55
	(0.002)	(6.62)
Village located in char area	-0.005	0.19
	(0.024)	(0.39)

Proportion of high land in upazila * log land asset (decimals)	-0.017**	-
	(0.007)	
Average annual rainfall (mm) in upazila * log land asset (decimals)	-0.006**	-
	(0.001)	
Village located in char area * log land asset (decimals)	-0.009**	-
	(0.001)	
Pseudo R^2	0.050	
Log likelihood	-285,258.5	
No. observations	**480,918**	

Source: InM survey data (2006–07).

Note: Figures in parentheses are standard deviations for mean column and standard errors for marginal impact column; ** and * indicate respective significance levels of 5 and 10 percent or better. The regression also includes dummies to control for unobserved fixed effects at the union level.

Table 12: Switching regression estimates of household food deprivation for recipients and non-recipients of support during monga

Characteristic	Starvation		General food deprivation	
	Support recipient	Support non-recipient	Safety-net benefits recipient	Safety-net benefits non-recipient
Household level				
Age of head (years)	0.003**	0.001	0.0002	0.0003
	(0.001)	(0.0008)	(0.0007)	(0.0003)
Age of head squared	-0.00002**	-0.00001	-0.00001	-0.00001
	(0.000001)	(0.00001)	(0.00001)	(0.00003)
Dependency ratio	-0.043**	-0.044	0.015	0.016**
	(0.020)	(0.027)	(0.007)	(0.007)
Log land asset (decimals)	-0.363**	-0.244**	0.092**	-0.001
	(0.134)	(0.108)	(0.037)	(0.031)
Has agricultural asset	-0.122**	-0.108**	-0.019**	-0.015**
	(0.015)	(0.017)	(0.004)	(0.005)
Has non-agricultural asset	-0.068**	-0.049**	-0.017**	-0.025**
	(0.013)	(0.013)	(0.007)	(0.004)
Has cash savings	-0.013	-0.034**	-0.017**	-0.013**
	(0.010)	(0.009)	(0.006)	(0.004)
Has livestock asset (cattle)	-0.044**	-0.033**	-0.005	-0.008**
	(0.007)	(0.006)	(0.003)	(0.002)
Has self-employed head	-0.049**	-0.006	0.007	0.012
	(0.013)	(0.015)	(0.005)	(0.014)
Has wage-employed head	-0.003	0.004	0.010**	0.009**
	(0.007)	(0.008)	(0.003)	(0.002)
Village or sub-district level				
Villagers have access to microcredit programs	0.015	-0.061	0.0001	-0.015
	(0.048)	(0.043)	(0.012)	(0.011)
Village unemployment rate	0.006	-0.019	0.022	-0.005
	(0.048)	(0.048)	(0.014)	(0.015)
Village located in char area	0.069**	0.035	0.009	0.011
	(0.033)	(0.038)	(0.013)	(0.012)
Proportion of high lands in upazila	-0.124**	-0.865**	-0.568**	-0.750**
	(0.018)	(0.068)	(0.077)	(0.077)

Average annual rainfall (mm) in upazila	-0.040**	-0.031**	-0.008**	-0.010**
	(0.004)	(0.004)	(0.001)	(0.001)
Village located in char area * log land asset (decimals)	-0.004	0.010	0.004*	0.010**
	(0.007)	(0.009)	(0.002)	(0.003)
Proportion of high land in upazila * log land asset (decimals)	0.129**	0.151**	-0.087**	-0.076**
	(0.034)	(0.036)	(0.019)	(0.016)
Average annual rainfall (mm) in upazila * log land asset (decimals)	0.001	0.0004	-0.0001	0.0003*
	(0.0006)	(0.0005)	(0.0002)	(0.0001)
Inverse Mill's ratio (λ)	0.771**	0.357**	0.771**	0.357**
	(0.001)	(0.0006)	(0.001)	(0.0006)
Wald χ^2 (33)	1,656.15		484.01	
Log pseudo-likelihood	-521,208.51		-109,841.56	
σ_1	0.455**		0.189**	
	(0.007)		(0.044)	
σ_0	0.466**		0.201**	
	(0.006)		(0.033)	
ϱ_1	0.021		-0.158	
	(0.034)		(0.248)	
ϱ_0	-0.013**		-0.086*	
	(0.044)		(0.050)	
No. observations	**480,918**			

Source: InM survey data (2006–07).
Note: Figures in parentheses are robust standard errors; ** and * indicate respective significance levels of 5 and 10 percent or better. The regression also controls for unobserved fixed effects at the union level.

Table 13: Impact of support received during monga on household food deprivation (N = 480, 918)

Household type	Starvation		General food deprivation	
During monga period				
Support recipients	-0.044**		-0.039**	
	(0.0002)	Difference =	(0.0001)	
Support non-recipients	-0.025**	-0.019**	-0.052**	Difference =
	(0.0001)	(0.0002)	(0.00003)	0.014**
				(0.00006)
During non-monga period				
Support recipients during monga	-0.044**		-0.015**	
	(0.0002)	Difference =	(0.0002)	Difference =
Support non-recipients during monga	-0.032**	-0.012**	-0.011**	-0.004**
	(0.0001)	(0.0002)	(0.0002)	(0.0003)

Source: InM survey data (2006–07).
Note: Results are based on the switching regression reported in Table 12. Figures in parentheses are robust standard errors; ** indicates a significance level of 5 percent or better.

Table 14: Impact of membership in safety-net programs on household food deprivation (N = 357, 863)

Household membership type	Starvation		General food deprivation	
During *monga* period				
Safety-net program member	0.045**		0.019**	
	(0.001)	Difference =	(0.0001)	
		0.011**		Difference =
Safety-net program non-member	0.034**		0.027**	-0.008**
	(0.0002)	(0.0005)	(0.00005)	(0.0001)
During non-*monga* period				
Safety-net program member	-0.042**		-0.063**	Difference =
	(0.0004)	Difference =	(0.0006)	-0.024**
		-0.005**		(0.0007)
Safety-net program non-member	-0.037**		-0.039**	
	(0.0001)	(0.0004)	(0.00003)	

Source: InM survey data (2006–07).
Note: Results are based on a switching regression similar to the one reported in Table 12. Figures in parentheses are robust standard errors; ** indicates a significance level of 5 percent or better. The sample excludes households that received support during monga but were not members of the three major safety-net programs.